III. Relating to the Graph of $Y = f(X)$ for Complex Variables.

By E. L. Rees, University of Kentucky.

The following is to suggest a slight modification of the geometric representation of $Y = f(X)$, (X and Y both complex) given by Professor Frumveller in the November, 1917, number of the Monthly.

Let $X = x + iy$ and $Y = u + iv$. Letting u be represented by perpendiculars to the plane of X we get a surface which pictures the variation of the real part of Y. On this surface draw the contours for $v = v_1$, v_2, etc., the consecutive v's differing by a constant. These contours enable us to visualize the variation of v, so that we have pictured the variation of both u and v and, therefore, of Y, all on one surface.

Let the surface be cut by planes parallel to the X-plane, the planes of all of the consecutive pairs being the same distance apart. Project these curves of intersection and the contours on the X-plane. The curves into which these curves project will be the images of the grating of lines parallel to the u and v axes in the Y-plane. We thus establish a simple relation between this scheme and the usual scheme of representation of functional correspondence in complex variable theory.

For the linear function the surface is a plane and the contours are lines in this plane perpendicular to its xy-trace. If the coefficients are real the plane is parallel to the y-axis.

For the quadratic function the surface is a hyperbolic paraboloid and the contours are the intersections of this surface and hyperbolic cylinders.

For $Y = \log X$ the locus is a funnel-shaped surface generated by revolving $u = \log x$ about the u-axis and the contours are the meridians of this surface.

The projections of these contours and the intersections of the surfaces by the parallel planes on the X-plane give the familiar curves associated with these functions.

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James Byrnie Shaw, Chairman, University of Illinois, Urbana.

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